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THE DISTRIBUTION OF ARNICA WILSONII RYDBERG AND ITS SIGNIFICANCE[1]

BERNARD BOIVIN

Arnica wilsonii Rydb. belongs to the *A. lonchophylla* Greene group and was long known only by the type collection made in 1902 about 140 miles up the Kapiscow River in northern Ontario. It was collected anew in 1946 by Dutilly and Lepage in northern Ontario, about 50 miles up the Attawapiskat, and again in 1950 by Schofield in northern Manitoba, on the Limestone River, about 50 miles west of Hudson Bay. This type of distribution, inland from the Hudson Bay and along a line roughly parallel with the present shoreline, is rather unexpected.

It has long been known that a number of entities presenting a disjunct range occur along the southern edge of Hudson and James Bays. The intervening area of northern Ontario and adjacent Quebec and Manitoba was very little known botanically, but it was expected that, when better known, it would show that many of those disjunct species really have a continuous range. As new collections continue to be made in this area, relatively few intervening localities for these disjunct species are turning up, but instead a new series of disjunct ranges is being discovered. These disjunct ranges seem to fall into four types:

1—Prairie outliers, such as *Linum lepagei* Boivin, a vicariant of *L. lewisii* Pursh, a common species in the Canadian Prairie.

[1] Contribution No. 1184, from the Division of Botany and Plant Pathology, Science Service, Department of Agriculture, Ottawa, Canada.

These occur around Hudson Bay mostly on sand dunes and other relatively dry habitats. They may occasionally occur inland in similar habitats.

2—Shoreline outliers, species that were presumably widespread around the Champlain Sea and along the shores of the larger glacial lakes bordering the continental ice-sheet during its last retreat, species that now exist around the Gulf of Saint Lawrence, Hudson Bay and around some of the larger inland fresh water lakes, relicts of still larger glacial lakes. These are strictly strand species, but may sometimes occur inland along former shorelines of the Champlain Sea and of late glacial lakes.

3—Cliff outliers, such as *Clematis verticillaris* DC.[2] whose detailed distribution will be given elsewhere. These occur on cliffs, mainly on present shore cliffs, but are frequently found inland on former shore cliffs of the Champlain Sea and of the glacial lakes.

4—Lowland outliers, such as *Cypripedium calceolus* L., which reaches north to the lowlands of the Saint Lawrence Valley and reappears northward around James Bay.

The distribution of *Arnica wilsonii* Rydberg, a species now found part of the way down the rivers draining into Hudson Bay, and a close segregate of *A. lonchophylla* Greene and *A. chionopappa* Fern. found near Lake Superior, seems to indicate the probable path of those northward migrations, namely the numerous north-flowing rivers with their headwaters near the Great Lakes or in the Canadian Prairie and also perhaps the glacial rivers that drained the glacial lakes southward into the Saint Lawrence and Mississippi basins.

Presumably these species first established themselves around the temporary lakes fronting the glacier after the edge of the ice cap had retreated beyond the Atlantic-Hudson Bay divide. As the ice front retreated, the glacial lakes gradually lowered their levels and successive shorelines were established and abandoned, each one farther north than the preceding shoreline, until the glacial lakes finally merged into the present Hudson and James Bays. Some species, such as *Tanacetum huronense* Nutt., *Thalictrum confine* Fern., etc., were apparently able to migrate from shoreline to shoreline and still exist around the modern

[2] See also: Boivin B., Les variations canadiennes du *Clematis verticillaris* DeCandolle et leur distribution (*in press*).

coast. Others, such as *Arnica wilsonii* Rydb., *Clematis verticillaris* DC., etc., were either unable to migrate that far north or to cope with such rapid changes of shorelines, but once established were able to persist inland until today and long after the disappearance of the conditions which originally favored their migration northward.

Another group of Hudson Bay disjuncts, the halophytes,[3] was discussed by D. Potter, Botanical Evidence of a Post-Pleistocene Marine Connection between Hudson Bay and the St. Lawrence Basin, RHODORA **34:** 69–89, 101–112. 1932. On the basis of phytogeographic data, Potter postulated the existence of a marine connection, or near connection, in the vicinity of the headwaters of the Ottawa River, between the Champlain Sea at its highest level and Hudson Bay at a former higher level. Potter's hypothesis and the above hypothesis are not mutually exclusive as most of the species concerned could have migrated northward along the coast of a large body of water regardless of whether the water was fresh or salty. We may consider that some of the species listed by Potter to support his theory, such as *Potentilla anserina* L., are really strand species and are in no way salt-water obligates. We may also consider that many other species, though being primarily halophytes, have turned out to be capable of persisting or establishing themselves away from the sea coast, such as:

JUNCUS GERARDII Lois. Former shores of the Champlain Sea (Ottawa); weed along railway embankments, etc. (Cochrane, Hope, Brandon).

ZANNICHELLIA PALUSTRIS L., var. MAJOR (Boenn.) Koch. Known to occur in fresh water marshes near the sea coast; sometimes persistent inland (Varennes).

CAREX MARITIMA L. and SCIRPUS RUFUS (Hudson) Schrad. The distribution maps given by Potter include some inland stations.

CAREX MACKENZIEI Krecz. (*C. norvegica* sensu Potter). This species is a good halophyte along the Atlantic seaboard but its Hudson Bay phase seems to be indifferent to fresh water if we judge by the collector's data on the three Hudson Bay specimens in our herbarium. These are as follows: 1—in dense mat on creek bank; 2—abundant in dense mats on willow flats; 3—very damp mossy ground.

POA EMINENS J. S. Presl. This is primarily a halophyte, but our collectors in Alaska report that it may sometimes be found a short distance

[3] See also: Boivin B., La Florule du mont Blanc, Gaspésie (*in press*).

away from the coast. At Seward, in particular, it may occur as a weed in town or as a pioneer species in vacant lots.

CAREX BIPARTITA Bell., var. AMPHIGENA (Fern.) Pol. (*C. glareosa* var.), ARENARIA PEPLOIDES L., MERTENSIA MARITIMA (L.) S. F. Gray. These are now known to occur all the way around the Labrador Peninsula and could very well have reached the James Bay region by following the outer sea coast.

PLANTAGO JUNCOIDES Lam., TRIGLOCHIN PALUSTRIS L., TRIGLOCHIN MARITIMA L., LATHYRUS JAPONICUS W. (*L. maritimus* (L.) Big.). These begin to appear along the lower Saint Lawrence at least 50 miles inland from the western limit of the brackish water.

POTAMOGETON FILIFORMIS Pers. This is a fresh water species occurring sometimes in slightly brackish situations.

SCIRPUS AMERICANUS Pers., MYRIOPHYLLUM EXALBESCENS Fern. These species occur indifferently in fresh water and brackish water habitats.

JUNCUS BALTICUS W., var. LITTORALIS Eng. Known to occur around Lake Saint John as a relict of the Champlain submergence and is therefore susceptible of adapting itself to fresh water conditions.

BIDENS HYPERBOREA Greene. Not a halophyte, but an estuarian species.

ZOSTERA MARINA L. A strict halophyte, not known to occur in the Hudson Strait (62° 30′) region, but it is not confined to the James Bay region. It is known to occur in West Greenland as far north as 64° 23′ and in the northern part of Hudson Bay, as far north as 61° 5′, only about 90 miles farther south than Hudson Strait, and could very well have entered the Bay from the north.

GLAUX MARITIMA L., var. OBTUSIFOLIA Fern. This variety occurs on the Saint Lawrence as far west as the contact zone between the fresh and the salt water where it is apparently submitted to alternating tides of slightly brackish water and almost fresh water.

Thus it would seem that some of the species used by Potter to support his theory could very well have reached the James Bay region by following the outer sea coast around the Labrador Peninsula, while all the others are sufficiently tolerant of inland and fresh water situations that their presence in that area could be explained away by the hypothesis outlined above. They could have first reached the upper Ottawa region via the Champlain Sea coast. They could then have colonized the coast and shores of the glacial lake a few miles away to the north. As the shoreline was displaced gradually to the north, first with the successively lower levels of the glacial lake, then with the progressively lower Hudson Bay waters, these plants were presumably able to colonize each successive shoreline until they reached their present location.

The chief weakness of Potter's hypothesis is that it postulates a maritime connection or near connection between Hudson Bay and the Champlain Sea at their higher levels. Geological evidence of such a connection or near connection has not been forthcoming.

On the other hand there is a very large clay belt extending over a wide area of northern Ontario and adjacent Quebec. This clay belt was deposited in a glacial lake that has been named Lake Ojibway. It extends north of the Hudson Bay-Saint Lawrence divide as far as about two-thirds of the way to James Bay. It also extends a short distance south of the present divide. There is some evidence to indicate that at its earliest stage and highest level Lake Ojibway was cut in two by an ice lobe extending across the Upper Ottawa Valley near the present continental (i. e. Arctic-Atlantic) divide. The southern half of the lake was located approximately where one now finds Lake Timiskaming. This latter half was called Lake Barlow. It is supposed to have discharged its waters via the Ottawa Valley. Lake Ojibway on the other hand is supposed to have had a series of successive outlets and shorelines that have not been yet worked out in detail.

As far as I am aware the exact relation between the south shore of Lake Ojibway or Lake Barlow and the north shore of the Champlain Sea has not yet been worked out in detail either, but in any event the two could very well have been no more than a few miles apart since the Ottawa arm of the Champlain Sea nearly reached the present divide while Lake Barlow extended some distance south of the same divide. Furthermore the two were undoubtedly connected by a very large glacial river.

This glacial river was probably very short, perhaps only 10 or 20 miles long, and if we consider that Lake Saint Peter, about 100 miles from brackish water and only 9 feet above sea level, is regularly submitted to a tide of about one foot in amplitude, it would appear quite possible that Lake Barlow may also have been subjected to small fresh water tides during its early stages, thus facilitating the invasion of its shores by plants of halophytic preferences.

It is not known whether those two bodies of water were ever actually in such close proximity. At any rate, all presently

known evidence indicates that, if there ever was any large body of water near the upper end of the Ottawa arm of the Champlain Sea, it was a glacial lake, and not a southern extension of Hudson Bay. Thus the presence of a series of halophytes in the James Bay area has to be explained either by a migration around the Labrador Peninsula, as seems to be the case for some of the species concerned, or else one has to accept the possibility of a migration via the shores of large bodies of fresh water in the manner outlined above. The species concerned do not seem to be essentially antipathetic to the presence of fresh water.

WHAT IS HYPERICUM PROLIFICUM?

H. K. Svenson

In Rhodora **42:** 9–10. 1940, before I really understood the method by which Linnaeus had treated his species, and when designating a type sheet seemed somewhat mandatory, I selected from among the five specimens representing *H. prolificum* in the Linnaean Herbarium, the sheet no. 20, which consisted of flowering branches with mostly linear leaves. A photograph of this material is provided by Fernald & Schubert in Rhodora **50:** 167. 1948. Linnaeus appended to his bibliographic treatment, among other descriptive notes, the words, "*Folia saepius revoluta, unde angusta Rosmarini*" (the leaves more often revolute, whence the narrow ones resemble those of rosemary). The other four sheets have broader-leaved specimens conforming in general to the ordinary accepted idea of *H. prolificum*. Therefore I considered sheet no. 20 as representing aberrant or unusual material of *H. prolificum*, and noted that Linneaus had realized the underlying situation in his differentia "lineari-lanceolati" in the polynomial specific name, and in the similar annotation at the bottom of sheet no. 20.

But Fernald & Schubert (loc. cit.) felt that the cited sheet no. 20 is specifically distinct from the remainder of the material, since (p. 168), "In the vast amount of herbarium material available, we have not been able to find anything which can be identified unquestionably with the Linnean sheet no. 20." I, on the contrary, remain of the opinion that sheet no. 20 represents